openreach

SIN 506

Issue 1.16
April 2025

Suppliers' Information Note

For The Openreach Network

Fibre to the Premises (FTTP) Generic Ethernet Access

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1. SERVICE OUTLINE 3
1.1 GENERAL...3
1.2 SERVICE AVAILABILITY...3
1.3 GEA CABLELINK 5
2. INTERFACE DESCRIPTIONS 5
2.1 GEA CABLELINK 5
  2.1.1 *Physical connection* *5*
  2.1.2 *Ethernet frame size* *6*
  2.1.3 *VLAN Tagging Options at the GEA Cablelink for GEA-FTTP*..........................*6*
  2.1.4 *Ethertype* *7*
  2.1.5 *Downstream Priority Marking*..*7*
  2.1.6 *Downstream policing* *8*
  2.1.7 *Downstream shaping* *9*
  2.1.8 *Upstream priority marking*..*10*
  2.1.9 *Upstream shaping*...*11*
  2.1.10 *Intermediate Agent/DHCP Relay Agent*...*11*
  2.1.11 *Ethernet OAM*..*14*
  2.1.12 *Transparency*..*15*
  2.1.13 *Frame duplication* *15*
  2.1.14 *Multicast IP Group Addresses*..*15*
2.2 ONT DETAILS..16
3. REFERENCES 16
4. ABBREVIATIONS... 17
5. HISTORY 18

1. Service Outline

1.1 General

Openreach will provide the Generic Ethernet Access/Fibre to the Premises (GEA-FTTP) product, part of Openreach's Next Generation Access (NGA) portfolio, over a shared passive fibre optic infrastructure.

This Suppliers' Information Note (SIN) provides details relevant to CPs regarding connectivity and interfaces.

It should be noted that the information contained within this SIN might be subject to change due to either the results of developments, or due to feedback from customers. Please check with the https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do site to ensure you have the latest version of this document.

1.2 Service Availability

GEA-FTTP will provide an 'always on' Virtual LAN (VLAN) between the Optical Line Termination (OLT) equipment in a BT exchange and each Optical Network Termination (ONT) device in the End User (EU) premises. This 'VLAN' will be able to carry data communication signals after the CP has successfully ordered service for delivery to its EU(s).

GEA-FTTP will consist of:

- Physical network connectivity between the EU premises and the Openreach point of handover to CP networks (GEA 'lit fibre' circuit)
- A 'Data Port' Ethernet VLAN offering the following bandwidths in Mbit/s:

Product	Downstream Peak	Downstream Prioritised	Upstream Peak	Upstream Prioritised
GEA-FTTP 0.5/0.5	0.5	0.5	NA	0.5
GEA-FTTP 40/2	40	15	NA	2
GEA-FTTP 40/10	40	15	NA	10
GEA-FTTP 55/10	55	20	NA	10
GEA-FTTP 80/20	80	30	NA	20
GEA-FTTP 110/15	110	20	NA	15
GEA-FTTP 115/20	115	55	NA	20
GEA-FTTP 120/20	120	55	NA	20
GEA-FTTP 160/30	160	110	NA	30
GEA-FTTP 220/20	220	30	NA	20
GEA-FTTP 220/30	220	110	NA	30
GEA-FTTP 330/30	330	40	NA	30
GEA-FTTP 330/50	330	110	NA	50

GEA-FTTP 550/75	550	110	75	50
GEA-FTTP 500/165	500	220	165	110
GEA-FTTP 1000/115*	1000	110	115	50
GEA-FTTP 1000/220*	1000	330	220	110
GEA-FTTP 1000/1000*	1000	110	1000	50
GEA-FTTP 1200/120	1200	110	120	50
GEA-FTTP 1800/120	1800	110	120	50

Table 1 – GEA-FTTP product rates

** The 1000M product provides a max Ethernet frame throughput of 987Mbps (excluding IFG and pre-amble). This is limited by the 1000BaseT interface and Ethernet framing overheads*

The 1.2G and 1.8G products are only available on ONTs with a 2.5Gbps LAN interface.

1.3 GEA Cablelink

The GEA Cablelink Product will be offered for the CP to order connectivity to the L2S in the same Point of Handover building.

This will comprise

- A 1Gbit/s Ethernet port into the L2S. The Gigabit Ethernet (GE) interface will be set to auto-negotiate, 1000Base-LX (Single Mode only); or
- A 10 Gbit/s Ethernet port into the L2S. The 10 Gigabit Ethernet interface will be set to 10000Base-LR (Single Mode only); and
- Fibre connection from the port on the L2S to the location within the same Point of Handover specified by the CP

CPs will need to specify as part of the ordering process the location of their equipment/presence to which the connection should be made.

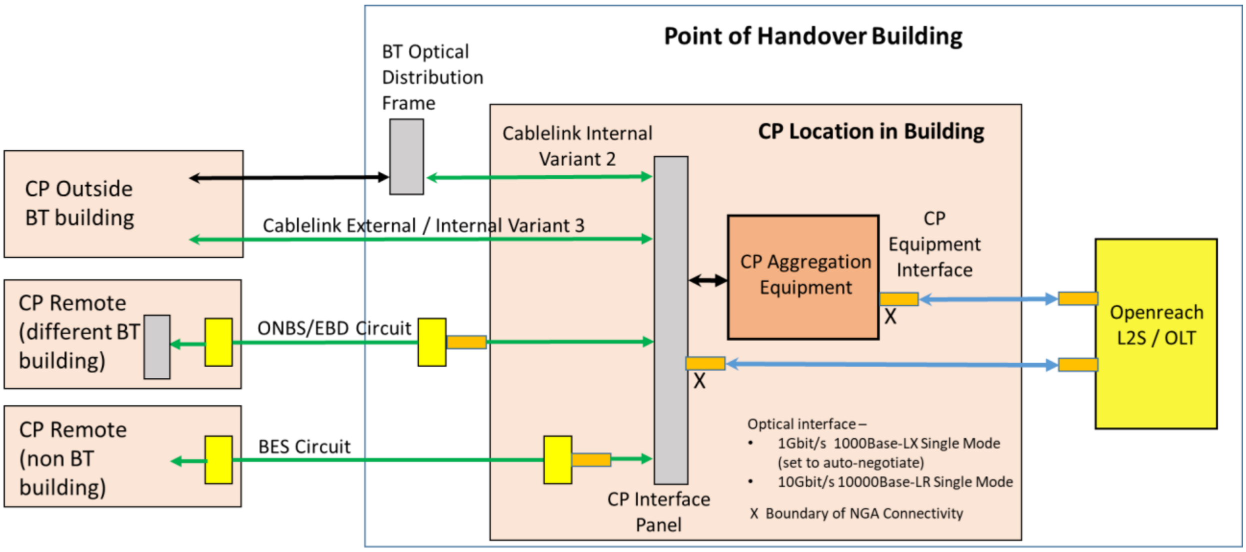

Point of Handover Building
BT Optical Distribution Frame
Cablelink Internal Variant 2
CP Location in Building
CP Outside BT building
Cablelink External / Internal Variant 3
CP Aggregation Equipment
CP Equipment Interface
X
Openreach L2S / OLT
CP Remote (different BT building)
ONBS/EBD Circuit
X
CP Remote (non BT building)
BES Circuit
Optical interface –
• 1Gbit/s 1000Base-LX Single Mode (set to auto-negotiate)
• 10Gbit/s 10000Base-LR Single Mode
CP Interface Panel
X Boundary of NGA Connectivity

Figure 1 – GEA Network and Connectivity Link

2. Interface Descriptions

2.1 GEA Cablelink

2.1.1 Physical connection

The identified interface option and location for the GEA Cablelink will need to be specified by the CP, either:

- CP owned and provided Interface Panel, or
- CP owned and provided equipment interface (Ethernet port).

The interface is the connector on the end of the Openreach fibre tail.

The following physical optical interface connector types only are supported for connection to the CP provided identified interface:

- Ferrule Connector (FC) / Physical Contact (PC)
- Lucent Connector (LC)
- Square Connector (SC)

Note - Angled connectors are NOT supported.

The physical interface must be specified on the order request. Any conversion of interfaces is the CP's responsibility, i.e. the CP must provide interface converters on its card or at the interface panel, if necessary. Openreach engineers must be provided with access to the identified interface point (whether that is an interface panel or the CP's actual interface card itself) for both fulfilment and assurance purposes.

GE and 10GE Single-Mode interfaces are described in SIN 360 [1].

More information about the GEA Cablelink product can be found in the GEA Cablelink Product Description on the Openreach Portal
(see http://www.openreach.co.uk).

2.1.2 Ethernet frame size

The maximum supported Ethernet frame size is 1530 bytes (excluding IFG and pre-amble)

2.1.3 VLAN Tagging Options at the GEA Cablelink for GEA-FTTP

2.1.3.1 Openreach added tags

On the GEA Cablelink, all traffic will be presented using single or double tagged on a per connection basis. Both options can be used on the same GEA Cablelink on a per GEA order basis. The tagging option to use for a specific GEA order is explicitly selected by the CP when ordering.

The VLAN used for EU traffic is referred to as a Customer VLAN or "C-VLAN".

A CP may optionally choose to use an additional level of VLAN tagging so that C-VLANs can be grouped within another VLAN, referred to as a Service VLAN or "S-VLAN".

- Single Tagged Handover
  - The Outer VLAN is the C-VLAN.
  - The Outer VLAN will carry the EU traffic and will have a tag in the range 2 to 3000 or 3071 to 4094*. Openreach will allocate the lowest available unused tag.
- Double Tagged Handover
  - The Outer VLAN is the S-VLAN, and the Inner VLAN is the C-VLAN.

---

* Please note, values between 3001 and 3070 are reserved for GEA Multicast.

  - Outer VLAN tag(s) must be requested via a Modify order against a GEA Cablelink (GEA Cablelink provision must be complete) before they can be used in a GEA order.
    - The Outer VLAN will have a tag in the range 2 to 3000 or 3071 to 4094.
      - The CP can specify the tag to be added; or
      - Openreach will allocate the lowest available unused tag if the CP does not specify the tag.
  - Where double tagging is required the CP must include the Outer VLAN tag value in the GEA order.
  - The Inner VLAN will carry the EU traffic and will have a tag in the range 2 to 4094. Openreach will allocate the lowest available unused tag.

2.1.3.2 CP added tags

For GEA-FTTP, CPs can optionally add tags in the downstream direction and these will be transported transparently through to the EU CPE. These are denoted as 'X-VLANs'

For GEA-FTTP, EU CPE can add tags in the upstream direction and these will be transported transparently through to the CP, with the exception of tag 0 which will be removed by Openreach (see section 2.1.8 for more details).

2.1.4 Ethertype

The Outermost VLAN Ethertype is configurable to 0x81-00 (default) or 0x88-A8 (as per IEEE802.1ad[4]. This applies to the GEA Cablelink as a whole and is irrespective of single or double tagging of the GEA services carried.

2.1.5 Downstream Priority Marking

2.1.5.1 GEA-FTTP Downstream Priority Marking

CPs can use the C-VLAN Priority Code Point (PCP) field[5] on downstream GEA-FTTP traffic on the Customer VLAN. For consistency with the GEA-FTTC product it is recommended that PCP values 0, 1, 2, 3 and 4 are used by CPs to differential downstream traffic classes. PCP values 5, 6 and 7 are supported only on GEA-FTTP.

In the event of congestion within the Openreach network, the markings will be used to identify which frames can be dropped first for a particular EU. PCP traffic marking is optional.

To allow Openreach to ensure that under congestion conditions traffic is discarded according to the CPs marking, with "can drop" traffic being dropped ahead of "should not drop" traffic, the following scheme will be used.

2.1.5.1.1 Per EU / Intra EU frame drop prioritisation

The C-VLAN PCP markings are used to identify the order in which traffic can be dropped.

- PCP = '1 to 7' = "Should Not Drop" (no drop priority differentiation between these four markings except on egress from the GPON port, and on the ONT LAN port)
- PCP = '0' = "Can Drop"

Where Double Tagging is used, the markings must be applied to the Inner C-VLAN.

The PCP field allows the CP to influence which frames are dropped first under congestion, thus allowing loss sensitive applications to have greater protection and at the same time allow best-efforts applications to benefit from full network capacity when it is available, but at the risk of frame loss. Openreach will remark the PCP field to ensure each EU has fair access to the available network capacity as follows:

- When an end-user's "Should not drop" marked traffic is supplied below the prioritised rate, then some of that end-users "Can drop" frames will be arbitrarily promoted to "Should not drop" so that, if possible, the "Should not drop" traffic rate equals the prioritised rate.
- Where an end-user's traffic is marked "Should not drop" and exceeds the prioritised rate, then some of that end-user's frames will be arbitrarily demoted to "Can drop" so that the rate of "Should not drop" traffic equals the prioritised rate.

Therefore, for optimal performance the CP should ensure loss-sensitive traffic is marked "Should not drop" and kept within the prioritised rate of the end-user's service.

All Openreach VLANs are removed on egress from the ONT LAN port. Any additional 'X-VLAN' tags added by the CP remain in the downstream direction remain.

2.1.6 Downstream policing

Each individual GEA-FTTP connection is policed by Openreach on ingress to the GEA Cablelink to the product rate. The details of the policing rates and associated burst sizes are detailed in Table 2 below.

Product			Policing parameters			
Peak rate (Mbps)	Prioritised rate (Mbps)	Sub-Product	CIR (kbps)	CBS (B)	PIR (kbps)	PBS (B)
0.5	0.5	GEA-FTTP	512	16000	512	16000

40	15	GEA-FTTP	15040	16000	40000	71000
55	20	GEA-FTTP	20032	16000	55040	83000
80	30	GEA-FTTP	30016	20000	80000	100000
110	20	GEA-FTTP	20032	16000	110016	118000
115	55	GEA-FTTP	55040	26000	115008	120000
120	55	GEA-FTTP	55040	26000	120000	123000
160	110	GEA-FTTP	110016	37000	160000	124000
220	30	GEA-FTTP	30016	20000	220864	124000
220	110	GEA-FTTP	110016	37000	220864	124000
330	40	GEA-FTTP	40000	22000	330048	124000
330	110	GEA-FTTP	110016	37000	330048	124000
500	220	GEA-FTTP	220032	52000	500032	124000
550	110	GEA-FTTP	110016	37000	550016	124000
1000	110	GEA-FTTP	110016	37000	1000000	124000
1000	330	GEA-FTTP	330048	64000	1000000	124000
1200	110	GEA-FTTP	110016	37000	1200000	388000
1800	110	GEA-FTTP	110016	37000	1800000	434000

Table 2 – GEA-FTTP policing parameters

The 1.2G and 1.8G products are only available on ONTs with a 2.5Gbps LAN interface.

Please see Section 2.1.7 for notes on the maximum recommended burst size for traffic shaping into the Openreach network. The policing behaviour is described below:

- If the CP sends a range of 802.1p marked traffic (0,1,2,3,4,5,6,7) for the GEA data service downstream to the GEA Cablelink, the following will be observed for bursts:
    - 802.1p = 0 marked traffic will have access to half of PBS
    - 802.1p = 1 to 7 marked traffic will have access to the full PBS
- If more than PIR is sent, then random drop across 802.1p = 0 and demoted 802.1p = 1 to 7 (i.e. the CP sent traffic marked as discard ineligible above the CIR rate) will be seen
- The policers act on the full packet, apart from the IFG & pre-amble i.e. VLAN tags, SA/DA, FCS

2.1.7 Downstream shaping

The CP is expected to shape the downstream traffic to match the product downstream rate (see section 1.2) to avoid excessive traffic loss. Where a 1000Mbps service has been provided to an ONT with a GE UNI port it is recommended that the Layer 2 shaping rate is set slightly below 1000Mbps to account for the physical throughput limitations of a GE port.

Openreach further recommends that CPs limit the maximum burst size of their shaper to 124kB for downstream product bandwidths above

160Mbps to account for subtle differences vendor in equipment performance and buffer capacities. This is optional but will help optimise performance. Please refer to Table 2 above for the recommended burst sizes for each Openreach product.

The information above is for guidance only. Test facilities are available to help CPs test and optimise configuration if required. Please contact your Openreach representative for details.

2.1.8 Upstream priority marking

CPs can (optionally) prioritise upstream traffic from the CPE to the ONT by marking their traffic with IEEE 802.1p markings in a VLAN. The GEA-FTTP service supports four upstream queues that are served in strict priority order

Queue	PCP markings
3	6 & 7; Highest priority, served first
2	4 & 5; served after queue 3 but before queue 1
1	2 & 3; served after queue 2 but before queue 0
0	0 & 1; Lowest priority, served last

Within each queue PCP markings are treated equally, e.g. 802.1p priorities 0 & 1 are treated equally within queue 0 with indiscriminate discard within the queue in the event of upstream congestion. Openreach therefore recommend that CPs employ a PCP priority scheme which maps services of different priorities into separate queues to maintain service differentiation. The Openreach GEA-FTTP service implementation is in accordance with IEEE 802.1Q-2018 [9] for devices with four queues (Table 8-5).All Openreach VLANs will be marked with an 802.1p priority of 2 at the Cablelink handover.

Handling of the VLAN tag varies.

- VLAN ID = 0: VLAN tag is removed by the ONT (802.1p markings still used for prioritisation). VLAN 0 is not reinstated downstream by the ONT as shown in Figure 2
- VLAN ID ≠ 0: VLAN tag will be forwarded to the CP (where this tag is forwarded, the CP must be able to handle this additional tag)

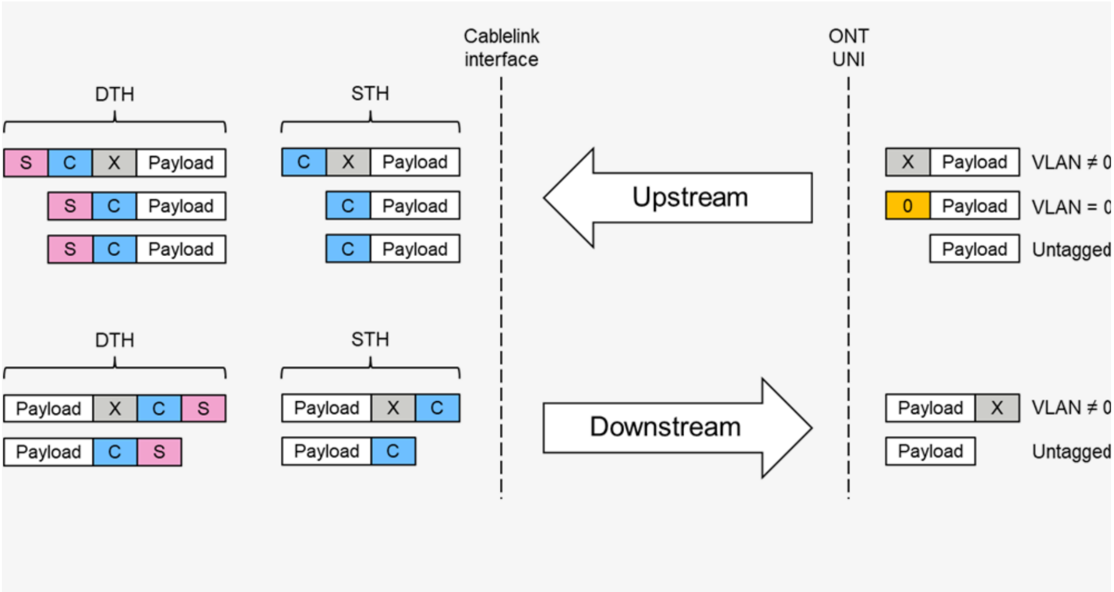


Figure 2 – Downstream and Upstream forwarding and Manipulation

2.1.9 Upstream shaping

The CP is expected to shape the upstream traffic to match the chosen upstream rate – see section 1.2.

In addition, the CP should consider the impact of upstream capacity on its GEA Cablelink.

Openreach will shape traffic into the GEA Cablelink. This shaping will treat all GEA-FTTP Data traffic equally. Specifically, it will not make use of any markings applied by the CPE.

Openreach will not explicitly manage traffic at an individual inner tag or outer tag level.

2.1.10 Intermediate Agent/DHCP Relay Agent

Where PPPoE is detected, additional tags will be inserted into the upstream flow (PADI) by the Intermediate Agent (IA) in the OLT. Any existing tags of the same type from the CPE will be overwritten. The IA tags will be removed by the OLT in the downstream direction (i.e. from the PADO, PADS messages).

Where DHCPv4 is detected, the OLT will insert Option 82 Agent information field into the upstream flow (DHCP Discover). The Option 82 field will be removed by the OLT in the downstream response (DHCP Offer).

The information inserted into PPPoE and DHCPv4 messages will be:

- Agent Remote ID – see below for format
- Agent Circuit ID – see below for format.

Where DHCPv6 is detected, the OLT may employ a Lightweight DHCPv6 Relay Agent (LDRA) at certain locations to insert Options 17, 18 and 37 into the upstream flow (e.g. DHCP Solicit):

- Option 17 'Vendor-specific Information": Includes sub-options for reporting line characteristics but will not include the line rate
- Option 18 'Interface-ID option': Used to identify the interface; similar to Agent Circuit ID
- Option 37 'Remote-ID option': Used to identify the client; equivalent to Agent Remote ID.

Speed information will not be inserted for DCHPv4, DHCPv6 or PPPoE for FTTP circuits. Access loop encapsulation information (sub-option 0x90) may be inserted on certain circuits but is not formally supported by Openreach and should therefore not be relied upon for FTTP.

The Option fields will be removed by the OLT in the downstream response (e.g. DHCP Offer).

The following information will be supplied.

Note - any information in these fields from the EU will be over-written

- **Agent Remote ID** – 63 character field – value is either
  - Value supplied by CP during provide / modify
    - From character set – a~z A~Z 0~9 @ . _ - ( ) / + : (Note space character is NOT supported)
    - Invalid characters in the order will cause order rejection

or

  - DeviceName/S VLAN ID/Frame No_Slot No_Port No/uservlan/C VLAN ID if the CP does not set a value to be used
    - Changes if the port is changed for any reason – cannot be guaranteed to be constant
    - Any value supplied from any modem will be over-written
- **Agent Circuit ID** – format depends on the vendor:

Vendor	Agent-Circuit-ID format	Sample
Huawei	access-Node-Identifier xpon frame/slot/port :ontid.uni.c-vlan-id	BAAHZN xpon 0/14/5:1.1.101
ECI	access-Node-Identifier xpon frame/slot/port :ontid.gemport.c-vlan-id	BAACJS xpon 0/11/5 :12.266.101
Nokia	access-Node-Identifier eth rack/frame/slot/port/onu/onuslt/uni	BAAHKB eth 1/1/16/10/3/1/1
ADTRAN	access-Node-Identifier xpon frame/slot/port:ontid.vlanid	BAALHQ-OLT7 xpon 0/0/42:0.2546

Table 3 – Agent Circuit ID formats

In all cases the “frame/slot/port” value may change if the port used is changed e.g. after port / card failureDHCPv4/v6 Port Numbers

2.1.10.1 Port Numbers

The expected UDP port numbers in the DHCP messages are detailed in the table below:

Scenario	Expected Destination MAC address towards server	UDP Port numbers towards ONT	UDP Port numbers from ONT
DHCPv4	Broadcast	Dst: 67, Src: 68	Dst: 68, Src: 67
DHCPv6	Multicast	Dst: 546, Src: 547	Dst: 547, Src: 546
DHCPv4 L2 Relay	Broadcast	Dst: 67, Src: 68	Dst: 68, Src: 67
DHCPv4 L3 Relay	Unicast	Dst: 67, Src: 67	Dst: 67, Src: 67
DHCPv6 L2 Relay	Multicast	Dst: 546, Src: 547	Dst: 547, Src: 546
DHCPv6 L3 Relay	Unicast	Dst:547, Src: 547	Dst:547, Src: 547

Table 4 – UDP port numbers for DHCP

The use of other UDP port numbers may result in the DHCP packets being silently discarded by the Openreach network.

2.1.10.2 Inverted DHCP/PPPoE

The scenarios shown in the diagram below, where a DHCP Server or BRAS is located at an EUs premises served by FTTC or FTTP are not currently supported by the GEA Data service. This may result in dropped session initiation frames and will result in the below scenarios not being able to successfully operate.

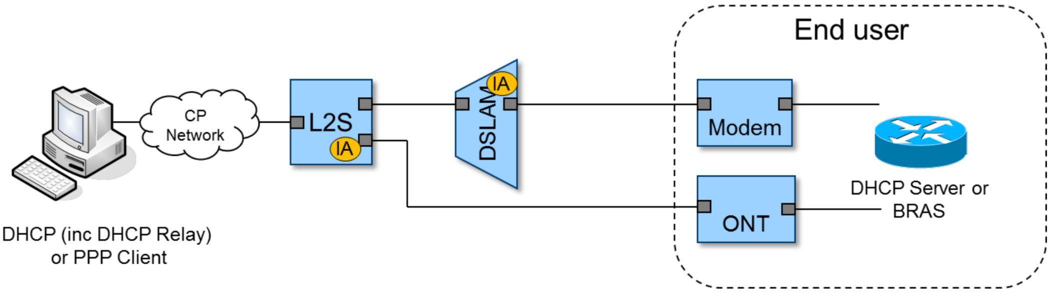


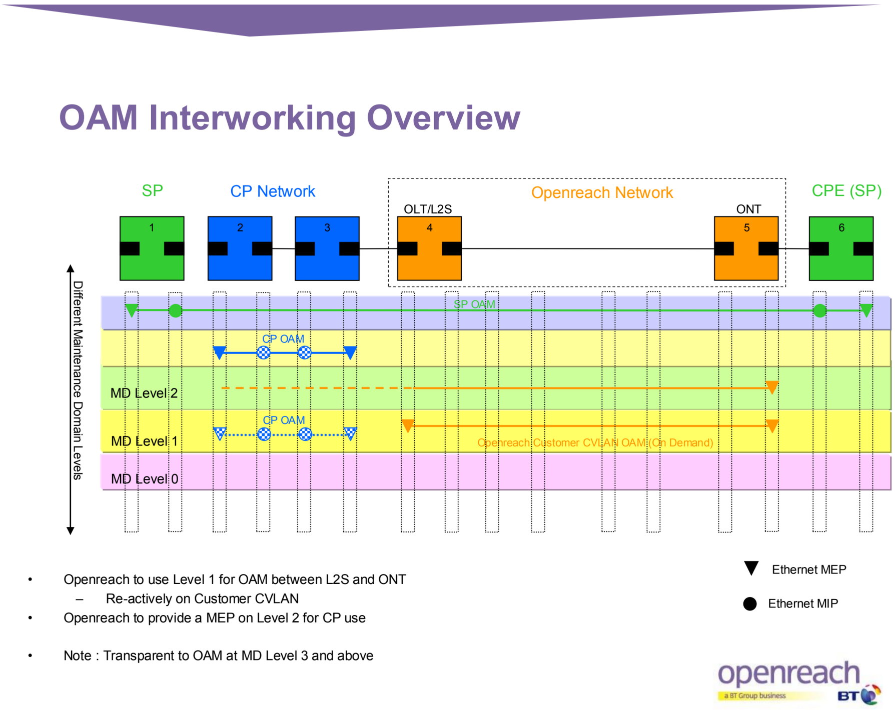
Figure 3 – Inverted DHCP/PPPoE

2.1.11 Ethernet OAM

CPs can send Ethernet OAM information end-to-end across their GEA-FTTP connection at MD Levels 3 and above.

CPs can also test their GEA-FTTP circuits end-to-end between the CP's equipment and the ONT. To do this CPs must use Multicast Loopback Messages (MC LBMs) as described in ITU-T Y.1731[8] at MD Level 2 with a destination MAC address of 01-80-C2-00-00-32. The MC LBMs must be transmitted at a maximum rate of 1fps.

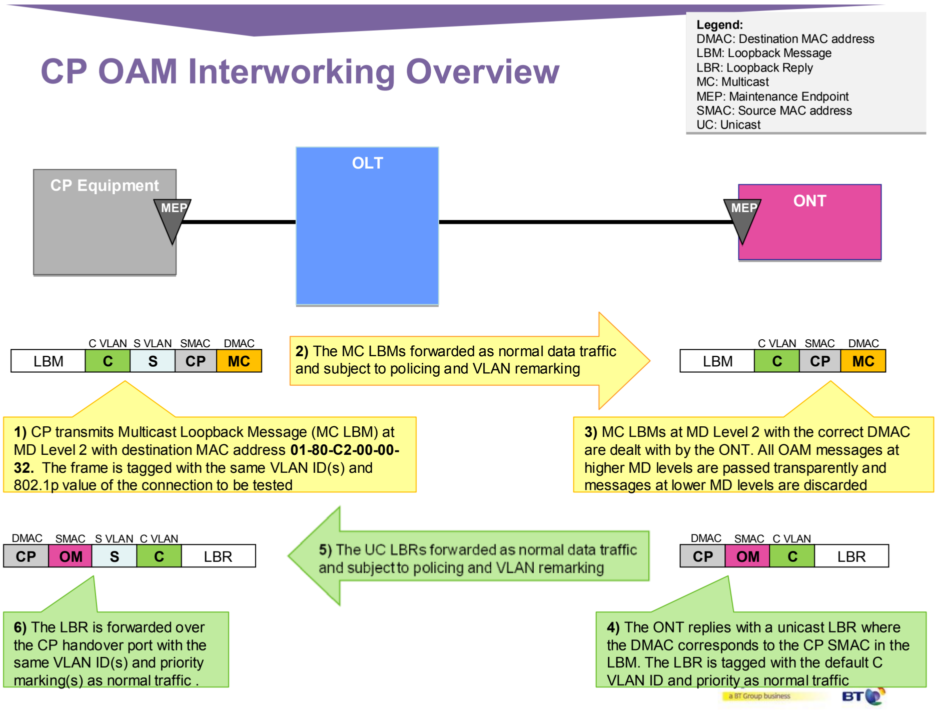
Working overview of OAM as follows:



OAM Interworking Overview

SP
CP Network
Openreach Network
CPE (SP)
OLT/L2S
ONT
1
2
3
4
5
6
SP OAM
CP OAM
MD Level 2
CP OAM
MD Level 1
Openreach Customer CVLAN OAM (On Demand)
MD Level 0
Different Maintenance Domain Levels
▼ Ethernet MEP
● Ethernet MIP
openreach
a BT Group business
BT

- Openreach to use Level 1 for OAM between L2S and ONT
    - Re-actively on Customer CVLAN
- Openreach to provide a MEP on Level 2 for CP use
- Note : Transparent to OAM at MD Level 3 and above



CP OAM Interworking Overview

Legend:
DMAC: Destination MAC address
LBM: Loopback Message
LBR: Loopback Reply
MC: Multicast
MEP: Maintenance Endpoint
SMAC: Source MAC address
UC: Unicast

2) The MC LBMs forwarded as normal data traffic and subject to policing and VLAN remarking

1) CP transmits Multicast Loopback Message (MC LBM) at MD Level 2 with destination MAC address **01-80-C2-00-00-32.** The frame is tagged with the same VLAN ID(s) and 802.1p value of the connection to be tested

3) MC LBMs at MD Level 2 with the correct DMAC are dealt with by the ONT. All OAM messages at higher MD levels are passed transparently and messages at lower MD levels are discarded

5) The UC LBRs forwarded as normal data traffic and subject to policing and VLAN remarking

6) The LBR is forwarded over the CP handover port with the same VLAN ID(s) and priority marking(s) as normal traffic .

4) The ONT replies with a unicast LBR where the DMAC corresponds to the CP SMAC in the LBM. The LBR is tagged with the default C VLAN ID and priority as normal traffic

2.1.12 Transparency

GEA-FTTP will be transparent to all valid Ethernet frames except:

- 802.3x PAUSE[6] - Local link flow control protocol
- Slow Protocols - Set of protocols that includes LACP and 802.3ah OAM
- 802.1X Authentication[7] - Authentication protocol
- Physical layer signalling such as auto-negotiation

2.1.13 Frame duplication

CP equipment must observe Ethernet bridging rules. In particular frames sent from Openreach to the CP must not be reflected back to the Openreach network with source MAC unaltered. This applies both downstream at the Cablelink port and upstream at the modem or DSL port.

2.1.14 Multicast IP Group Addresses

Since the multicast MAC address is derived from the IP group address, CPs shall ensure that IP group addresses are unique in the lower 23 bits.

2.2 ONT Details

This section lists the various ONT models provided and supported by Openreach. The full specifications of each ONT model are available via the Openreach Portal and not replicated here.

Vendor	Model	LAN ports	New supply
Adtran	SDX 611B	1 x 1GE	No
	SDX 611D	1 x 1GE	Yes
	SDX 611Q	1 x 2.5GE	Yes
	SDX 614	4 x 1GE	Yes
Nokia	G-010G-Q	1 x 1GE	Yes
	G-010G-R	1 x 1GE	No
	G-010G-T	1 x 2.5GE	Yes
	G-040G-B	4 x 1GE	Yes
	G-240G-B	4 x 1GE 2 x ATA voice	No
Huawei	HG8010H5-20	1 x 1GE	No
	HG8110H-20	1 x 1GE 1 x ATA voice	No
	HG8240	4 x 1GE 2 x ATA voice	No
ECI	B-FOCuS O-4G(s)2PUb/c	4 x 1GE 2 x ATA voice	No
	B-FOCuS O-4G2PUb/e		
	B-FOCuS O-4G(s)2PUb/g		
	B-FOCuS O-4G2PCM BT		

3. References

[1]	SIN 360	Ethernet Customer Interfaces, Interface Characteristics.
[2]	SIN351	BT Public Switched Telephone Network (PSTN): Technical Characteristics Of The Single Analogue Line Interface

[3]	ND1646	ND1646 NGA-Telephony; Management V1.1.1 http://www.niccstandards.org.uk/publications/index.cfm
[4]	IEEE 802.1ad	Virtual Bridged Local Area Networks, Amendment 4: Provider Bridges
[5]	802.1D-2004	IEEE Standard for Local and metropolitan area networks - Media Access Control (MAC) Bridges
[6]	802.3x	Flow Control
[7]	802.1x	Port Based Network Access Control
[8]	ITU-T Y.1731	OAM functions and mechanisms for Ethernet based networks
[9]	IEEE 802.1Q	Bridges and Bridged Networks

4. Abbreviations

ATA	Analogue Telephone Adaptor
BS EN	British Standards – English
CP	Communications Provider
CPE	Customer Premises Equipment
CVLAN	Customer VLAN
DHCP	Dynamic Host Configuration Protocol
DLM	Dynamic Line Management
DSCP	Differentiated Services Code Point
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
IEEE 802.1p	3 bit field within a VLAN used to indicate priority
EU	End User
FC/PC	Fixed Connection – fibre optic connector
FTTP	Fibre To The Premise
FVA	Fibre Voice Access
GEA	Generic Ethernet Access
ID	Identifier

IEEE	Institute of Electrical and Electronics Engineers
IFG	Inter-Frame Gap
L2S	Layer 2 Switch
LC	Local/Lucent Connector
MDI/MDIX	Medium Independent interface (cross-over) – Ethernet port connection
NGA	Next Generation Access
NTE	Network Termination Equipment
OAM	Operations, Administration, Maintenance
OLT	Optical Line Termination
ONT	Optical Network Termination device
PADI	PPPoE Active Discovery Initiation
PADO	PPPoE Active Discovery Offer
PADS	PPPoE Active Discovery Session- confirmation
PCP	Priority Code Point aka 802.1p priority
PSU	Power Supply Unit
PPM	Parts Per Million (Clock Accuracy)
PPPoE	Point to Point Protocol over Ethernet
QoS	Quality of Service
SC	Standard Connector
SIN	Suppliers' Information Note (BT Publication)
VLAN	Virtual Local Area Network
SVLAN	Service VLAN
1000 Base – LX	Single Mode

5. History

Issue	Date	Changes
1.0	October 2010	Date of first issue
1.1	January 2013	Updated to include FVA specific information and new GEA FTTP product rates

1.2	February 2013	Updated to add details of Inverted DHCP/PPPoE processing - Section 2.1.7.1
1.3	March 2015	Change SINet site references from http://www.sinet.bt.com to http://www.btplc.com/sinet/
1.4	December 2016	Added new GEA-FTTP product rates and 10G cablelink details
1.5	November 2017	Added new GEA-FTTP product rates, 1+1 ONT details and updated DHCP and policing information
1.6	December 2019	Updated ONT details, including new 1+0 ONT.
1.7	April 2020	Change SINet site references from http://www.btplc.com/sinet/ to https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do
1.8	June 2020	Clarifications around the variable Intermediate Agent capabilities and tidying of product rates. Statement to confirm cessation of BBU installs. Power supply information table added.
1.9	August 2021	Clarified the VLAN 0 behaviour at the ONT
1.10	February 2022	Added maximum recommended shaper burst size, and access loop encapsulation
1.11	May 2022	Added change in US Pbit marking
1.12	August 2022	Clarified Client ID insertion format
1.13	October 2022	Included products for 2.5G ONTs, and added ONT technical specifications
1.14	March 2023	Added policer rate details for the 1.2G and 1.8G GEA-FTTP products
1.15	February 2025	Added details of the 1G symmetric product. Removed FVA
1.16	April 2025	Clarified burst capacity for yellow traffic

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